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IV

NOTES ON SOME LAND SNAILS OF THE SIERRA  
NEVADA MOUNTAINS, WITH DESCRIPTION OF A  
NEW SPECIES

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In order to gather definite information regarding some little known species of land snails of the California Sierra Nevada two trips were made by us to these mountains in 1921. We went first to Columbia in Tuolumne County and searched for one day and a part of another for *Epiphragmophora circumcarinata* (Stearns). Columbia is said to be the type locality of this rare form, known in the field only to its discoverer, Crawford. We did not find it but we secured much valuable material of the *E. mormonum* group. In fact, this material made it apparent that a trip to the type locality of *mormonum* would be necessary.

This led us to Mormon Island in Sacramento County, on the second trip. After we had secured an abundance of specimens of *mormonum* there, it became very evident that a revision of this difficult group of snails could not be attempted until much more collecting had been done at other places. With very considerable series of specimens already available, it appears probable that, to the north, *mormonum* passes into *fidelis* by imperceptible gradations, while to the south and west the series can possibly be connected directly with such diverse forms as *dupetithouarsii*. It is hoped that this remarkable situation can be fully exposed after two or three more years of collecting.

At Mormon Island a species of *Polygyra* was discovered, which appears to be new, and on the same trip we found *Ammonitella yatesii* Cooper at its type locality in Calaveras County. Our notes on these forms are offered herewith because it does not seem desirable to withhold them indefinitely while field work progresses on other subjects.

**Ammonitella yatesii** Cooper

Plate IV, figures 4, 5, 6, and 7

In 1869, J. G. Cooper<sup>1</sup> created the genus *Ammonitella* to contain a very odd species of land snail which was discovered in Calaveras County, California, by Lorenzo G. Yates after whom the species was named. The genus received its name because of its superficial resemblance to an ammonite. It also resembles *Planorbis* to a remarkable degree. Dr. Cooper remarked that if the evidence had not been conclusive of its being a land snail, it surely would have been taken for a freshwater form.

Indeed, it happened that no less authority than Timothy A. Conrad was misled by this resemblance the following year when he described the Oregon fossil, "*Planorbis lunatus*."<sup>2</sup>

*Ammonitella yatesii* remains to this day one of the rarest of our good species of snails. So far as the available records show, it has, until now, been collected but once since its original discovery. This was by the veteran, Henry Hemphill, as might be expected. He went to the type locality especially for it and has given us an account of his experiences in the rare publication "*Zoe*."<sup>3</sup> Until he visited the region, it had been surmised that the species was a cave dweller. He collected considerable numbers of specimens at Cave City and at Murphy's, six miles away. The original collection of Yates contained but five specimens. James H. Ferriss has not recorded it from further south in the Sierra,<sup>4</sup> and it would be hard, considering his reputation, for us to believe he had missed it. S. N. Lowe<sup>5</sup> did good work both north and south of the known range of the species but failed to find it. For these reasons we are led to suspect that it is confined to the limited limestone and marble region in the eastern part of Calaveras County. And it seems likely that it is associated in some manner with the caves, although it does not actually live within them. There is also a cave at Murphy's although Hemphill did not mention it.

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<sup>1</sup>Am. Journ. Conch. Vol. IV, p. 209, 1869.

<sup>2</sup>The full synonymy of this species has been given in Univ. of Oregon Publ. Vol. 1, No. 6 August, 1920.

<sup>3</sup>Vol. III, p. 45, 1892.

<sup>4</sup>Nautilus Vol. XXXI, p. 33, July, 1917.

<sup>5</sup>Nautilus, Vol. XXX, p. 95, Dec. 1916.

Very uncertain has been the relationship of the species and genus as interpreted by various conchologists. Cooper thought it a distinct genus. Binney, however, did not consider it different from the European *Gonostoma*,<sup>6</sup> and stated that the animal was "as in *Patula*;" this would place it in the family *Endodontidæ* as now recognized. Pilsbry<sup>7</sup> placed it in *Polygyrella* (*Helicidæ*) on dentition and shell characters while Hemphill thought it a "*Helix*." Specimens in the University of California Collection are labeled "*Anchistoma*." Thus this species has been placed in at least five different genera in 50 years, a change, on the average, of once every 11 years. Much of this uncertainty has resulted from the remarkable form of the shell and the fact that the soft parts have been unknown.

Cave City is an old, abandoned mining camp. A single dilapidated shack and a concrete dam across the creek recall the activities of other days. It is 10 miles east of San Andreas, and some of the road leading there is very bad. Emmet Rixford, Jr., soon located the unmarked cave about a quarter of a mile up stream from the dam on the west bank of the north fork. It had once been prepared for exploitation but the walks and walls leading to it are brush and grass-grown, and its wooden door has rotted and collapsed. The entrance is narrow and could be easily overlooked. It enters a deposit of white marble and has brown stained stalagmites and stalactites from the beginning.

Our first search led us inside of the cave where we looked under the loose stones, boards and in the humus which is gathered on the floor. A few dead shells of *Epiphragmophora mormonum* were all that rewarded us. The ammonitellas were soon found, however, immediately outside of the entrance, under moss-laden stones. Here we found them alive and dead in abundance. Buckeye trees cast a dense shade over the place. The animals were not aestivating, yet all of them were retracted within their shells when found. We did not find any at a depth greater than one foot beneath the surface; 40 yards away from the cave they could not be located in the brief time at our disposal, although conditions there appeared equally favorable. In an hour the three of us secured 80 alive and 180 dead. *E. mormonum* was abundant with them but no other species was seen.

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<sup>6</sup>Man. Am. Ld. Shells, p. 113, 1885.

<sup>7</sup>Man. Conch. Vol. IX, 2nd ser., p. 80, 1894.

The finding of these animals alive gives a long-looked-for opportunity to study the anatomy. Externally they are pale, translucent-gray with dark bands dorsally where the optic retractor muscles show through. The skin has a delicate reticulation; pedal grooves are absent which definitely excludes the species from the Endodontidæ. The tail is acutely pointed and keeled in the median line above. No caudal mucous gland could be found. If the species were a cave dweller the eyes would be expected to be functionless or absent, but they appear normal in every respect. This is likewise true of the nerves which lead to them. The animal is very timid and retracts within its shell upon slight provocation.

The genitalia are of the usual type of American Helicidæ of the Polygyra group, as shown by the accompanying figure. The vas deferens and hermaphroditic duct are entirely without convolutions. The spermatheca in the specimens examined, was located just beneath the heart; therefore, the duct was very long and slender.

Jaw widely arched and marked with transverse ribs. Three specimens examined had 15, 26 and about 35 respectively. Binney<sup>3</sup> has figured one with 13 ribs and states that the number is "about 12." Such variation illustrates the little value which can ordinarily be placed in the ribbing of this organ in the classification of species.

The mantle is marked by a series of black spots of uniform size which do not coalesce or join to form blotches as is usual in Polygyra; and they do not extend to the right as far as the intestine which is darkened by minute pigment specks.

The kidney is a triangular pouch at the upper end of the pallial cavity and the urethra bends back upon it from the outer point before it bends to the right to meet the intestine.

It thus becomes apparent that *A. yatesii* belongs to the Helicidæ and the anatomy presents no such radical departure as the shell. There seem to be no anatomical reasons for considering the genus distinct unless it be in the attachment of the penis retractor muscle to the floor of the mantle cavity. The shell, however, differs so essentially from all others that we seem justified in considering it to belong to a distinct genus. Many groups have been separated upon much less definite grounds.

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<sup>3</sup>Man. Am. Ld. Sh. p. 113, 1885.

The affinities of the genus appear to be with *Polygyrella* as Pilsbry foresaw; and both genera are not distantly removed from the polygyras of the *germana* and *loricata* groups.

The enormous length of time the genus has been in existence is very remarkable. The fossil, *A. lunata* (Conrad), is abundant in the John Day Basin strata of central Oregon which are supposed to be of Oligocene age. That form differs little from *A. yatesii*; in fact, Stearns considered them so close that he made the fossil a subspecies (*præcursor*), overlooking the fact that Conrad had previously named it. Whole families, even orders, of mammals have completely died out of the region in the meantime, yet our little land snail has barely changed specifically. Considerable speculation on the rate of evolution in the various groups of animals might well be prompted by a further careful comparison of such facts as these.

#### ***Polygyra penitens* Hanna & Rixford, new species**

Plate IV, figures 1, 2, 3, and 8

Shell dark brown when alive, aperture with a violet tinge; a little more than five well-rounded whorls; spire about evenly rounded above and below; uppermost two or three whorls smooth, remainder, hirsute; hairs in rows which follow the growth lines and fairly evenly spaced so that they are also in irregular, diagonal rows; individual "hairs" are in reality flat, lammella-like projections of epidermis; umbilicus very wide, contained only four times in greatest diameter of shell; apertural teeth three; all weakly developed for this group of *Polygyra*; palatal and basal, rounded tubercles; parietal somewhat lamellar but not curved as in many species of the genus; peristome reflected but not so abruptly as in the *P. devius* group.

Numerous specimens were found on the south bank of the south fork of American River near the hamlet, Mormon Island, Sacramento County, California. The locality is about  $\frac{1}{8}$  mile west of the road which leads north at that point and just before the wagon bridge is reached. It is  $1\frac{1}{2}$  miles east of Folsom Penitentiary; this proximity suggested the name *penitens*. American River at this point is a swift, narrow, rocky stream and the snails were found living among rocks and plant debris on a dry but

shady hillside. *Epiphragmophora mormonum* and *E. tudiculata cypreophila* were associated with them.

Diameter mm.	Altitude mm.
7.9	3.5 Fig'd type
8.0	3.2 Fig'd paratype
8.0	3.5 Fig'd paratype

*Type*: No. 692 and two paratypes, No. 693, Mus. Cal. Acad. Sci. Eighteen other specimens, No. 21,610, Systematic series, Mus. Cal. Acad. Sci. Other specimens are in the Rixford Collection.

*Type-locality*: Mormon Island, Sacramento County, California.

This species is closer related to *Polygyra roperi* (Pilsbry)<sup>9</sup> than any other. That species is hirsute and has a wide umbilicus, but is less elevated (it was described as subdiscoidal), the whorls increase less rapidly in size, the constriction is less marked behind the aperture and the aperture is less oblique. The palatal tooth in *penitens* is rounded-tubercular, not quadrate as in *roperi*. The basal tooth is nearer the center of the basal margin in *penitens*, and the parietal tooth is not long and curved as in *roperi*. But the greatest difference between the two species lies in the character of the epidermis. *P. roperi* is truly hirsute, the projections being actual hairs, although short; in *penitens* they are flat and lamella-like.

The comparison of the species has been made possible through the courtesy of Dr. Henry A. Pilsbry of the Academy of Natural Sciences of Philadelphia where two specimens of the rare *P. roperi* are preserved. Both species appear to be related to *Polygyra loricata*; but that form does not have the very wide umbilicus and the hirsute epidermis is not so well developed.

Another species which bears a superficial resemblance to *P. penitens* is *Polygyra harfordiana*<sup>10</sup> (W. G. Binney). (Not *Poly-*

<sup>9</sup>Nautilus, Vol. III, p. 15, figs. 1889. Binney, 3rd suppl. etc. Bull XIX, Mus. Comp. Zool., p. 212, fig. 1890.

<sup>10</sup>Binney first used the name *harfordiana* with the genus *Triodopsis*. (Terr. Moll., Vol. V. Bull. IV, Mus. Comp. Zool., p. 309 name only, no description, pl. VIII, fig. R and text fig., 1878. Described in 2nd Suppl. to same, Bull. XIII, Mus. Comp. Zool., p. 37, pl. I, figs. 6, 7, 1886.) Cooper however, described his shell as *Dadolochila harfordiana*. (Am. Journ. Conch., Vol. V, p. 196, pl. XVII, fig. 8, 1869.) Since the two species were originally described under different genera, and are now considered to belong to different genera, Binney's name appears to be the proper one. The rule "once a synonym always a synonym" can hardly apply in such an instance. Therefore, the substitute names for Binney's species, *Helix salmonensis* Tryon (Man. Conch., Vol. III, 2nd ser., p. 146, 1887), and *Helix commutanda* Ancey (Conchologist's Exchange Vol. II, p. 79, 1887) should be discarded.

*gyrella harfordiana* (J. G. Cooper.) That species is described in one place as being "sparsely hirsute" and on the following page, "scarred as if it had been hirsute." The specimens were collected by Henry Hemphill on Salmon River, Idaho, and three labelled by him, "Original lot," are in the collection of the California Academy of Sciences. These are not, properly speaking, hirsute; they are smooth and shining as many other forms of the *Polygyra devius* group, but they are slightly pitted on the surface. Moreover, although Binney gives the diameter and altitude of his *Triodopsis harfordiana* as "8" and "3" mm. respectively, the smallest of the three specimens referred to measures 8.7 mm. by 4.4 mm. And, while the umbilicus is wide, it is not proportionately as wide as in *roperi* or *penitens*. In fact it appears from careful study that *Polygyra harfordiana* (W. G. B.) is a dwarfed variation of some member of the *Polygyra devius* group. All of these seem to have the peristome abruptly reflected and the palatal tooth, when present, not set within the aperture. The aperture, moreover, is almost, if not quite, in a plane when looked at toward the axis. In the *loricata* group it is not in a plane and the palatal tooth is set slightly within the margin. Among typical members of the two groups there is great difference in size but this can be bridged in large series as Hemphill did when he discovered *sanburni*, *harfordiana*, and some others.

Hemphill collected a series of specimens near Healdsburg, Sonoma County, California also, which he described under the name, "*Helix* var. *sonomaensis*."<sup>11</sup> The type lot consists of five shells which now form No. 8041, of the Museum of the California Academy of Sciences. The original label calls it a subspecies of *loricata*. Hemphill's generalized description hardly does justice to what appears to be a perfectly good species. He did not mention the characters which are so obvious through the microscope. The species has a wider umbilicus than is usual in *loricata*, but it does not approach the deeply-reamed cavity of *roperi* or *penitens*.

The finding of some of the snails at Mormon Island alive enables us to figure the genitalia. In all essential respects the usual characters of the genus are exhibited. The jaw has 10 flat, faintly indicated, transverse ribs in the type specimen.

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<sup>11</sup>Trans. San Diego Society of Natural History, Vol. 1, No. 3, p. 101, 1911.

This makes the fourth species of the *loricata* group. One is very widely distributed in northern California, but the other three are extremely localized. *P. roperi* was first found in 1889 at Redding, California, and has been found there once since and there only. The new species was found at the type locality only, in spite of a considerable amount of collecting which was done in various other portions of the Sierra foothills.